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THE TOPOGRAPHY OF ORGANS IN TYPICAL SEGMENTS OF HIRUDO.

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I wish, first of all, to acknowledge my indebtedness to Prof. C. O. Whitman for the incentive to this work, and for much kindly assistance. The work was begun in the hope that it might throw some light upon the question of the limits of the somite in the leeches. No attempt will be made to discuss this question. I shall merely endeavor to describe the position of organs in relation to the annuli, in the hope that this may be of some assistance to future workers in the field of metamerism.

The 15th, 16th, and 17th segments were taken as typical in this species (*Hirudo medicinalis*). These segments are in that region of the body where the original position of parts has been least modified by displacement, fusion or otherwise.

Gross dissections were first carefully studied, and then the more exact location of organs was determined from a study of thick sections, both longitudinal and sagittal. The leeches were killed in about 0.05 of one per cent. solution of chromic acid, in which they died in an expanded condition. Immediately after opening them by a dorsal median cut through the body-wall, the latter was pinned back on each side, or else two lateral cuts were made and the entire dorsal portion of the body-wall removed. In the latter case one could better observe the relation of the organs to the sensory ring which had been previously notched at each side. In preparations intended to show merely the alimentary canal, the blood, which is usually found to distend it, served, when hardened by the reagents used, to keep the canal distended and thus to preserve its shape.

In case organs lying below the alimentary canal, such as nerve cord, testes, etc., were to be studied, the canal was at once opened dorsally and the blood washed out. The preparation was then kept for a few hours in water, and the organs to be studied were exposed by the removal of connective tissue. Extreme care was necessary in order that the organs should not

be displaced by this work of dissection. Preparations were preserved in formalin or alcohol.

The material to be sectioned was hardened in 3 per cent. chromic acid for a day or two, and after the usual washing and dehydrating, cleared in xylol and embedded in *soft* paraffine. Very thick sections were cut, cleared in xylol and mounted serially in Canada balsam. They were studied under a dissecting microscope with fairly high power lens. The relation of particular organs to the limits of the rings was carefully estimated by placing under the slide a piece of thin paper with straight ink-marks across it.

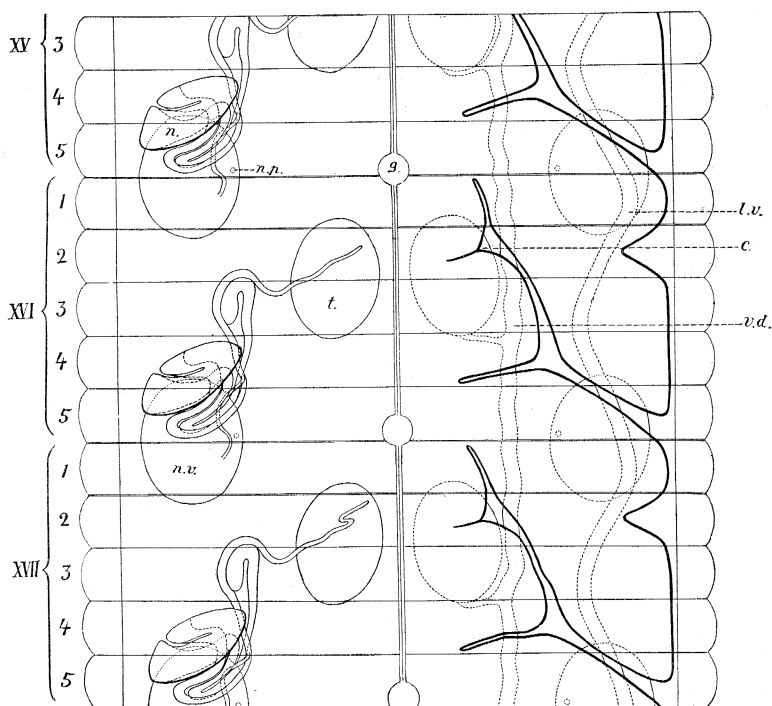
There was considerable variation in the position of the nerve ganglion with reference to the sensory ring of the somite to which it belonged. From a table of measurements I selected the specimen which showed an average position of the ganglia. The three ganglia in this specimen (K) all projected beyond the anterior limit of the sensory ring to which they belonged, and lay largely in the fifth ring of the preceding somite. The proportion thus found in front of the limit of the somite was 0.7 in the case of the ganglion of the sixteenth; 0.8 for that of the seventeenth; and likewise 0.8 for the ganglion of the eighteenth somite. The observations extended over a series of thirteen specimens. The measurements, similarly taken in all specimens, were as follows :

Somite.	16th.	17th.	18th.
A	1.0	0.6	x
B	1.0	0.8	1.0
C	1.0	1.0	1.0
D	1.4	1.3	1.0
E	0.6	0.7	x
F	0.6	0.6	0.8
G	0.7	1.8	1.6
H	0.5	0.5	0.8
I	0.7	0.8	0.5
J	0.0	1.2	1.7
K	0.7	0.8	0.8
L	0.5	x	0.8
M	0.3	0.7	0.9

NOTE.—No. 1.0 indicates that the ganglion in question lies wholly within the fifth ring of the preceding somite; a decimal

fraction shows the proportion of the length of the ganglion lying within it; while a figure like 1.5 shows that the posterior part of the ganglion lies 0.5 of its total length in front of the limit between the sensory ring and the fifth ring of the preceding somite.

By means of the sections the position of the ganglia and the prominent constriction of the alimentary tract (*C*) was in each case determined. For the position of the other organs, I relied upon a study of the gross dissections.



Segments of XV, XVI and XVII of *Hirudo medicinalis* ($\times 12$).

The outline of the alimentary tract is shown by the heavy line on the right side of the plate. Structures underlying other organs are shown by broken lines. Organs or parts of organs lying beneath portions shown by broken lines, are represented by dotted lines.

n, nephridium; *np*, nephropore; *t*, testis; *g*, ganglion; *c*, constriction of alimentary tract; *nv*, nephridial vesicle; *vd*, vas deferens; *lv*, lateral vessel.

The results can be best studied by referring to the accompanying plate. In the region presented by it, the alimentary tract consists of a rather narrow tube with two pairs of out-

growths in each somite. Attention may first be called to the place marked (*C*). This is a very pronounced constriction occurring similarly in each of the somites studied. It is far more marked than the other constrictions in the somite. This probably marks the primitive metameric limits of the alimentary tract. This is merely a suggestion, as a study of the embryology of this form would be necessary, before a definite statement could be made in regard to this point. The more prominent of the two sets of pouches are those opening into the alimentary tract at the posterior end of each somite. The testes (*t*) are situated chiefly in the second and third rings, their ends projecting slightly into the adjoining rings. The vas deferens connecting them is shown only on the right-hand side of the drawing.

The nephridia, shown on the left-hand side of the drawing, are much coiled, extending from the nephrostome at the tip of the testis lobe in the front part of the second ring, to the end of the duct by which the nephridial vesicle opens to the exterior through the nephropore. This nephridial vesicle lies in the fifth ring of the somite to which it belongs and the sensory, or first ring of the somite immediately posterior. It projects slightly beyond each of the two rings named. The nephropore is situated in the extreme posterior part of the fifth ring.

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